CSE 2251: DATABASE SYSTEMS [2 1 0 3]

Database-System Applications, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Database Architecture, NoSQL, Data Sharding, Database Schemas, Keys, Relational Query Languages, Relational Operations, SQL Data Definition, SQL Data Types and Schemas, Integrity Constraints, Set Operations, Aggregate Functions, Overview of SQL Query Language, Basic Structure of SQL Queries, Join Expressions, Overview of the Design Process, The Entity-Relationship Model, Extended E-R Features, Reduction to Relational Schemas, Features of Good Relational Design, Atomic Domains and Normalization, File concepts, Indices Concept, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices, Transaction Concept, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

References:

1. Silberschatz, Korth, Sudarshan, *Database System Concepts*, (6e), McGrawHill, New York, 2011.
2. *Pramod J Sadalage, Martin Fowler, NoSQL Distilled, Addison-Wesley, 2013*
3. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, *Fundamentals of Database Systems*, (6e), Pearson Education, United States of America, 2011

DATABASE SYSTEMS
[Revised Credit System]
(Effective from the academic year 2018-19)
SEMESTER - IV

Subject Code	**CSE 2251**	**IA Marks**	**50**
Number of Lecture Hours/Week	**03**	**Exam Marks**	**50**
Total Number of Lecture Hours	**36**	**Exam Hours**	**03**

CREDITS - 03

Course objectives: This course will enable students to

- To understand the fundamental concepts of relational model
- To develop and query the database using Structured Query Language
- To understand the Entity Relationship Model for database design
- To use the normalization forms in building an effective database schemas
- To interpret the different indexing and hashing methods and understand transaction concepts

Module -1	**Teaching Hours**
INTRODUCTION: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Database Users and Administrators, NoSQL, Sharding. **RELATIONAL MODEL:** Structure of Relational Databases, Database Schemas, Keys, Schema Diagrams, Relational Query Languages, Relational Operations, Relational Algebra – Fundamental Operations, Formal Definition of Relational Algebra, Extended Relational Algebra Operations. **Text Book 1:** Chapter 1: 1.1- 1.9, 1.12, Chapter 2: 2.1 – 2.6, Chapter 6: 6.1 **Text Book 2:** Chapter 2: 2.1-2.3, Chapter 4: 4.1,4.2	**7 Hours**
Module -2	

STRUCTURED QUERY LANGUAGE: SQL Data Definition, SQL Data Types and Schemas, Integrity Constraints, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Nested Subqueries, Additional Basic Operations Null Values, Modification of the Database. Join Expressions, Views, Transactions. **Text Book 1:** Chapter 3: 3.2 – 3.9; Chapter 4: 4.1 – 4.5	**8 Hours**
Module – 3	
DATABASE DESIGN USING E-R MODEL: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity- Relationship Diagrams, Entity-Relationship Design Issues, Extended E-R Features, Reduction to Relational Schemas. **NORMALIZATION:** Features of Good Relational Design, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional Dependency Theory, Algorithms for Decomposition ,Decomposition Using Multivalued Dependencies. **Text Book 1:** Chapter 7: 7.1-7.8, Chapter 8: 8.1-8.6	**10 Hours**
Module-4	
INDEXING AND HASHING: File Organization, Organization of Records in Files, Basic concepts, Ordered Indices, B+ Tree Index Files, B+ Tree Extensions, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing., Bitmap Indices **Text Book 1 :** Chapter 10: 10.5 -10.6, Chapter 11: 11.1 -11.8 **TRANSACTION MANAGEMENT:** Transaction Concept, A simple Transaction model, Transaction Atomicity and Durability, Transaction Isolation , Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. **Text Book 1**: Chapter 14: 14.1,14.2,14.4-14.8, Chapter 16: 16.1- 16.4,	**11 Hours**
Course outcomes:	

After studying this course, students will be able to:

1. Understand the basic concepts of database and relational model
2. Apply structured query language for data retrieval
3. Use and design databases using E-R models
4. Analyze and apply the normalization technique to decompose given relational schema into effective schemas
5. Explain the method of indexing, hashing and organization of files and apply the different transaction properties for serializability and recovery algorithm.

Text Books:

1. *Silberschatz, Korth, Sudarshan, Database System Concepts, (6e), McGrawHill,New York, 2011.*
2. *Pramod J Sadalage, Martin Fowler, NoSQL Distilled, Addison-Wesley, 2013*

Reference Books:

1. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, *Fundamentals of Database Systems*, (6e), Pearson Education, United States of America, 2011.
2. Thomas Connolly, Carolyn Begg, *Database Systems – A Practical Approach to Design, Implementation and Management*, (4e), Pearson Education,England, 2005.
3. Peter Rob, Carlos Coronel, *Database Systems–Design, Implementation and Management*, (10e), Course Technology, Boston, 2013.